who were aiding the American army, Kane first vanquished a group of Mexican cavalry, then protected his prisoners from the vengeance of his companions.

The Arctic disappearance of Sir John Franklin's expedition gave Kane the goal he had been seeking. Volunteering as surgeon for the first Grinnell expedition under Lt. Edwin J. DeHaven, U. S. N., Kane was one of the group of British and American searchers who found in 1850 the first relics of Franklin's men. During the winter of 1850–51 Kane met and bested the twin challenges of the Arctic—cold and scurvy—as the tiny American vessel *Advance* drifted helplessly in the ice pack. On his return to America, he lectured, wrote a book on his experiences, and courted (against his family's wishes) the spiritualist Margaret Fox. Continuing to dream of the Arctic, especially of that romantic age's best-known geographical fantasy—the Open Polar Sea—Kane determined to lead his own expedition. With Franklin's fate still undiscovered, the philanthropist Henry Grinnell launched a second party, led by Kane. From 1853 to 1855 Kane and his men survived incredible hardships farther north than any earlier explorers by adapting the Eskimo techniques of survival (which made it possible half a century later to conquer both poles). On Kane's example, including his humane treatment of the Smith Sound Eskimos and his reconnaissance of the sound itself, were founded the achievements of his successors down to Peary.

Corner's stirring account of Kane's expedition, described in a British review of Kane's 1856 book as "the most daring and the most terrible in the records of maritime adventure," makes up about a third of this volume. Handsomely produced and illustrated and modestly priced, this outstanding book deserves the widest possible audience. I have only one minor criticism—the six maps, though excellent, do not permit the reader to locate every place mentioned.—*Harold L. Burstyn, History of Science and Technology, Carnegie-Mellon University*

HEAVISIDE, Oliver. *Electromagnetic Theory*, Vols. 1–3. 1717 pp. Chelsea Publishing, 1971. $39.50 the set.

Contemporary scientists, engineers, and historians will find the works of Oliver Heaviside especially interesting because his life spanned the most dynamic period in the development of electrical theory. In 1850, the year of his birth, corpuscular theories of electricity held tenacious grasp in the minds of most scientists; Faraday's emphasis on the medium as the seat of electrical action was known but ignored until Clerk Maxwell brought Faraday's heresies to orthodoxy through mathematical expression in his *Treatise on Electricity and Magnetism* (1873).

Reading Maxwell's text changed Heaviside's life. A telegraphic operator and contributor of technical papers to the *Telegraphic Journal*, *British Mechanic*, and *Philosophical Magazine*, he resigned his job—never to be employed again—and, in the guise of a classical nineteenth-century mathematical physicist intent on describing the propagation of waves in an omnipresent ether, pursued his romance with electricity. His conviction that cathode rays were streams of electrons (1888–97) led him grudgingly to alter the Maxwellian theory he had laboriously attempted to complete. Before he died in 1925, Heaviside witnessed a third great theoretical upheaval—Einstein's relativity theory—which banished, in the minds of most scientists, his beloved ether to the realm of fantasy. Despite these reversals in theory, despite his own intransigent personality and his alienation from the scientific community, Heaviside left his mark on mathematics, electrical theory, and electrical technology through his unique combination of theoretical mathematics and engineering applications.

An essay by Sir Edmund Whittaker, summarizing the historical setting in which Heaviside worked and attempting (unsuccessfully, in this reviewer's opinion) to evaluate his principal contributions, introduces the first volume of this third, unabridged edition of *Electromagnetic Theory*. Additional historical essays, which complement rather than overpower the work, are also included, among them B. A. Behrend's notable evaluation comparing Heaviside to Archimedes, Newton, Kelvin, and Faraday. The main text, collected over a quarter of a century, covers a broad range of topics in the loosely connected chapters. Heaviside himself tied together broad areas rather than attempting a tightly organized logical exposition. Each volume represents an identifiable stage in his intellectual development and, despite unevenness, each contributes substantially to a comprehension of the breadth and depth of his achievements. The last volume proves the most interesting of the three, for in its final chapters are reflected Heaviside's attempt to come to grips with the events of the closing years of the nineteenth century, when the discovery of the electron posed a new hurdle to understanding the relations among matter, electricity, and ether.

The bulk of his text is difficult, if not impossible, for anyone unacquainted with higher mathematics. Even in developing his mathematics, Heaviside used a style that approaches the inimitable, guiding one through his mathematics with a running narrative rather than leaving one alone to face the frequent mental leaps.

In these volumes one meets the man himself, rather than a structure of ideas representing a fragmentary account of an intellectual episode. This is entirely appropriate, as "natural philosophy" was the heart and soul of Heaviside, the one great love of his life, the one great joy—and sorrow—of his existence. Despite the recognition and medals that came his way late in life, it is safe to say that he never received the acclaim that he justly deserved. It is to be hoped that this unabridged reprint will provide a measure of success with a more appreciative audience.—*R. E. Gardner, Engineering, Cornell University*

RÉNYI, Alfred. *Letters on Probability*. 86 pp. Wayne State University Press, 1972. $2.95, paper.

The central part of this attractive little book contains an English translation of some letters on probability purporting to be from Pascal to Fermat. These are held to have been discovered by Henri Trouverien, whose name should guarantee their importance. The plot is an ingenious one: to show by easy stages how controversial still are the philosophical problems of applicability and interpretation of probability theory. The letters were convincingly written and carefully drafted, but, of course, by the late Professor Rényi of Budapest, who died in 1970. Together they make up a useful introduction to the subject of the philosophical foundations of probability theory, and the letters would be all the more amusing if genuine letters resembling them were ever to turn up—as well they might.—*John North, History of Science Museum, Oxford University*

SCHLEE, Susan. *The Edge of an Unfamiliar World: A History of Oceanography*. 398 pp. E. P. Dutton, 1973. $10.95.

This is the best general history of oceanography available, a fine introduction not only to the history but to the science itself. The story of scientific exploration of the oceans is full of adventure—the great *Challenger* Expedition, the voyages of the *Meteor*, the *Michael Sars*, the *Fram*, and others up to the *Glomar Challenger*—all are told with spirit and energy, but in every case the intellectual adventure is seen as an inherent part of the account of